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PROJECT NARRATIVE

THE OK-FIRST! PROJECT

Executive Summary

This is a Demonstration Project intended for the application area of Public Safety. **OK-FIRST!** will implement an interactive, 21st century support-system for police, fire, and civil defense to provide timely and relevant environmental information and forecasts. In Oklahoma, where the economy and lifestyle are closely tied to often-changing weather conditions, public safety agencies historically have been hindered in informed decision-making by an inadequate telecommunications infrastructure, no central repository of real-time environmental information, and little end-user training. Unfortunately, the needed but perishable information rarely makes it into the hands of first-response decision officials in rural communities, even though it is partially available from the National Weather Service (NWS). Fortunately, Oklahoma has implemented statewide access to the Internet through its OneNet, which was partially funded by TIIAP. **OK-FIRST!** will exploit linkages with OneNet and relevant agencies to bring public safety into the information age.

Problem Definition

Traditionally, the lifestyle and economy of Oklahoma have been tied to the environment. The state's largest industries (agribusiness, transportation and construction) are heavily dependent upon often-changing and sometimes extreme weather conditions. Since February 13, wildfires burned over 650,000 acres as a result of drought conditions that rival the dust bowl days. These extreme conditions contributed to a probable loss of the state's $5 billion annual wheat crop, curtailed tourism in state parks by nearly 50% and created untolled economic repercussions. During "more normal" periods, Oklahomans regularly contend with tornadoes and floods -- events that probably are more common in Oklahoma than elsewhere -- along with occasional wildfires and chemical spills. Yet, *Oklahoma is a microcosm of the nation* when considering how agencies respond to emergencies: *local decision-support systems generally suffer from a near-complete lack of current environmental information.*

It is generally accepted that a thorough understanding of weather information is essential if public safety agencies are to respond correctly to impending severe weather, hazardous chemical spills and range fires, or the closing of roads and bridges during severe winter conditions. Yet, *access to* the National Information Infrastructure (NII) is not the *total* solution.

Accordingly, **OK-FIRST!** (**OK**lahoma's **F**irst-response **I**nformation **R**esource **S**ystem using **T**elecommunications) proposes to implement an interactive, 21st century *information and support-system* for public safety agencies to provide timely, detailed and relevant environmental information and forecasts (e.g., wind speed/direction, burning indices, location of the freezing-line and more). **OK-FIRST!** will use two telecommunications technologies in Oklahoma: (1) *OneNet*, an expansion of the communications network operated by the Oklahoma State Regents for Higher Education and financed through a statewide bond issue and previous TIIAP grants;

and (2) *OLETS* (the Oklahoma Law Enforcement Telecommunications System), a digital telecommunications network to serve critical needs of law enforcement. OneNet and OLETS are discussed on pages 35 and 36, respectively.

The **GOAL** of **OK-FIRST!** is to develop a transportable, agency-driven information system that helps public safety agencies harness the information age. The *End Outcomes* are documentable improvements in how these agencies respond to emergencies.

OK-FIRST! proposes to: (1) establish the initial base-line of knowledge, skills and abilities of end-users about using the NII; (2) establish computer linkages ~~to~~ via OneNet and OLETS for ~~about 32~~ 50 out of a pool of 400 civil defense offices, 850 fire departments, and 700 law enforcement agencies (all OLETS agencies will have access to a subset of **OK-FIRST!** products); (3) secure adequate computer hardware and software for ~~the local agency~~ 32 local agencies; (4) provide access to the suite of the Oklahoma Mesonetwork (Mesonet; See Appendix), NEXRAD (see glossary), and NWS products plus innovative products from partnerships with other agencies; (5) provide one week of computer instruction for each participant; (6) provide one week of instruction on "how to use and apply" the many environmental data sources available from the NII; (7) provide routine follow-up support throughout the project (on-site visits, on-line conferencing, surveys); and (8) quantify the impact of **OK-FIRST!** by documenting changed work-habits and new approaches to old problems using an evaluator. **OK-FIRST!** will provide computer hardware and software to 32 agencies. An additional 18 agences, who already have adequate computer equipment, will have access to the same product suite, training materials, and end-user support as the original 32 agencies.

OK-FIRST! is the next logical extension toward improving the TIIAP-endorsed telecommunications infrastructure in Oklahoma. A planning grant (1994) and a demonstration grant (1995) to the Oklahoma Department of Commerce (ODOC) resulted in improvements to OneNet. **OK-FIRST!** builds upon these successes by introducing rich information content into the Oklahoma infrastructure and providing training on its proper use.

Tremendous strides occurred with advancing science and the implementation of new technology. At least an order of magnitude of increased information has been produced as a direct result of a $4.4 billion modernization and restructuring of the NWS. Yet, consider the following:

> "For many years, the National Weather Service ... operated on the assumption that if they produced a good product, someone would come to get it and use it. ... Users are currently left largely to their own devices in determining what is available and how to use it; many are unaware of the information available." [Quotes from 1980 report of the National Research Council]

Even so, almost no effort has materialized anywhere that will interface public safety agencies with a modernizing NWS and other sources of information. As a result, *the NII is a vast, unexplored territory*. It seems evident that access to *and proper use of* the NII needs a jump-start.

OK-FIRST! can influence, but not accomplish on its own, the broader goals associated with public safety's mission to prevent the loss of life and property. Their goals are influenced by events outside the control of both **OK-FIRST!** and public safety officials. **OK-FIRST!** *can only measure the correctness and timeliness of decisions made based upon available information.*

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Technical Approach

To reach its target audience, **OK-FIRST!** is built upon the solid foundation of two statewide telecommunications networks plus a modem bank at the Oklahoma Climatological Survey (OCS). OneNet (Figure 1) consists of 33 hub sites generally located at learning institutions and extends Internet access to each site, connecting them with dedicated fiber and leased lines. At a minimum, each hub site permits dial-up connections using SLIP or PPP. Access will be extended to other sites from the hubs. For example, a previous TIIAP-funded project places 20+ community kiosk sites around Oklahoma. The kiosk locations are unknown as this proposal is being submitted, because the kiosks are being awarded competitively by ODOC. **OK-FIRST!** will have access to network connectivity at the kiosk sites, but may have to place additional equipment (e.g., hubs, terminal servers and/or modems) since the hardware at each kiosk site is determined through the competitive grant process.

OK-FIRST! also will use OLETS, a private leased-line digital network that serves over 750 law enforcement and related agencies. OLETS *directly serves* 120 municipalities (Figure 2) with 160 terminals. At least two-thirds are towns with populations under 15,000. These OLETS agencies also provide OLETS access to surrounding communities via radio, phone, or FAX. Additional OLETS details are presented in the Appendix.

For agencies that desire **OK-FIRST!** connectivity but cannot gain access to OneNet or OLETS, a modem pool with 1-800 service will be established at OCS. This modem pool can be utilized by agencies who need emergency access (e.g., with laptop computers and cellular phones).

OCS receives a variety of real-time meteorological observations: Oklahoma Mesonet data, NEXRAD imagery, NWS products, and stream gauge data. In addition, test-mode output from a sophisticated computer model (known as ARPS) will be available. Products will be automatically produced from these and other data sources. For example, Figure 3 shows an alert message generated when Mesonet wind speeds exceed severe limits. The Burning Index from the Oklahoma Fire Danger Rating System (Figure A), produced using Mesonet and satellite data, indicates fire intensity should fires erupt. Products for **OK-FIRST!** will be produced using two Silicon Graphics UNIX workstations that will be connected to WWW servers and an OLETS server. Product generation is distributed over multiple workstations to allow for redundancy in case one of the machines requires service and to accommodate expansion.

For the past decade, the NOAA/Forecast Systems Laboratory (FSL) has been developing a "dissemination project"; it has focused on developing products for emergency management agencies in Colorado. Examples of several products (a relative humidity image for diagnosing heat exertion, storm total rainfall accumulation for estimating flooding potential, and a winter precipitation type and accumulation product) to be replicated by **OK-FIRST!** are shown in Figures B-D. These products illustrate the diversity of the information content and the multiple scales on which the information will be presented (i.e., county level, statewide, or regional).

For agencies that connect via OneNet, one computer will be deployed at each agency to ensure dialup OneNet access using 28.8 Kbps modems. Experience with the OneNet hub at OU indicates that busy signals sometimes restrict access. Public safety agencies will have *guaranteed* access. Each agency will have World Wide Web (WWW) access to the product suite, full Internet

access including e-mail, and private conferencing with other participants and **OK-FIRST!** staff. For OLETS agencies, menus will be added to their terminal software to allow them to request products from a server dedicated to OLETS. Automated alerts will be distributed to OLETS agencies on a predetermined basis, and similarly to OneNet agencies using e-mail .

Because **OK-FIRST!** is built upon two scalable telecommunications networks, scalability of **OK-FIRST!** is solely dependent upon the product generation and server hardware and software. The systems used for **OK-FIRST!** are industry-standard, off-the-shelf equipment. Platform-independent protocols (e.g., TCP/IP) are utilized whenever possible to facilitate expansion. OLETS uses a proprietary transmission protocol, but plans are to use TCP/IP when OLETS upgrades to NCIC-2000 standards (defined in glossary). E-mail and conferencing will be implemented using commercially-available software (FirstClass™ available from SoftArc in Toronto). This proven system uses secure procedures for protecting user information. The WWW server will maintain authentication for sensitive information.

Maintenance has always been a prime concern for OCS/Mesonet. This philosophy carries over to **OK-FIRST!**. Since **OK-FIRST** involves the dissemination of *real-time* data to first-response personnel, watchdog programs will alert on-call staff using a paging system.

OK-FIRST! will be implemented in phases (see Time Line on page 26). First, public safety agencies who currently use Mesonet information will be convened to brainstorm about useful products. Applications for the first group of participants will be distributed, and participants will be chosen. During the first year, computers will be purchased and installed for product generation and web serving. In addition, the OCS modem bank will be established. Training the first participants will occur towards the end of the first year. The second year will consist of training two additional groups. Previous groups will be given refresher courses.

Ability to Serve as a Model

The proposed model will provide timely and relevant information to public safety personnel through interactive telecommunications. The model also *provides a training and a peer-support program* to promote proper application of information in emergency situations. Interactive support and peer communication will be accomplished via e-mail and on-line "conferencing."

In 1992, the National Science Foundation (NSF) funded the EARTHSTORM model whereby OCS personnel created and led nine inservice institutes for K-12 teachers to incorporate real-time Mesonet data into classroom activities. One difference between ES and **OK-FIRST!** is that product dissemination will occur through a WWW server in **OK-FIRST!**. Because schools are just beginning to access the Internet locally, a bulletin-board server (BBS) became the primary method of telecommunications. Another major difference is that ES used custom end-user software for data *analysis*; **OK-FIRST!** is product driven and creates pre-made products.

The innovation demonstrated in **OK-FIRST!** is multifaceted. Currently, the NWS is testing a *broadcast* system of data dissemination to the civil defense community. The Emergency Management Weather Information Network is aimed primarily at storm spotting during severe weather (e.g., tornado watches and warnings); it will not provide data on the local county level. Conversely, **OK-FIRST!** concentrates on *interactive* use of county-level information.

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Recent dialogue with the FSL Dissemination Project Manager prompted him to note:

"there is a need for a state agency to act as a 'bridge' between the ... NWS ... and OK state and local governments. ... state and local governments in OK will benefit from a state agency assisting [in] their acquisition and utilization of modernized weather information. ... Likewise, ... the NWS ... would benefit from feedback from a state agency regarding state and local government users."

OK-FIRST! will extend FSL's accomplishments to public safety agencies in Oklahoma using data sources and telecommunications systems unavailable in Colorado. **OK-FIRST!** will empower rural public-safety officials by providing the equipment, *training, and on-going support* that these offices cannot provide for themselves. As convincingly demonstrated by rural teachers in EARTHSTORM, rural public-safety agencies also should become extensive users of data via **OK-FIRST!** and form a tight-knit community of peers across the networking infrastructure.

The transfer of **OK-FIRST!** beyond Oklahoma can be accomplished easily because the technologies implemented in Oklahoma (hardware, software, networking) are commonplace in many states. All states have their OLETS equivalent and most have widespread Internet linkages. In fact, law enforcement in 30 states use products purchased from the OLETS vendor, and all states must adhere to the new NCIC-2000 standards. Once a telecommunications infrastructure within a state is established, OCS will serve as a role-model to advise agencies in other states on how to adapt data-ingest and management, product development, and quality control techniques to their own situations. The documented benefits to public safety in Oklahoma will aid other states in obtaining financial support to establish similar systems.

OK-FIRST! will become self-sustainable after the initial, two-year implementation of the project. Continuation of the project will be secure because it relies heavily on stable, annually-funded telecommunications and remote observing systems. Sustainable, automated dissemination of services will be developed during **OK-FIRST!**. Participant support will be merged into the regular user-support operations of OCS, as occurred when ES funding expired. Oklahoma is uniquely suited to serve as a testbed that develops methodologies to apply environmental data to decision making. Not only does Oklahoma have the instrumentation to measure the environment, but it experiences every type of environmental hazard except hurricanes and volcanoes.

Applicant Qualifications

OCS has operated and maintained the Oklahoma Mesonet since the network's inception in 1991. The international respect given to the Mesonet is unquestioned. For example, OCS manages at least 5 unique data collection systems for *other agencies*. **OK-FIRST!** will provide public-safety agencies access to these unique data. OCS has demonstrated an ability to provide near real-time environmental data on a reliable basis to a growing number of agencies.

OCS personnel are well qualified (by experience, academics and documented results) to work with public safety personnel to develop relevant environmental products. Linkages to public safety personnel already are established; they only need to be upgraded and fully-utilized for the NII to become part of the daily routine in these offices. OCS's qualifications do not stop at retrieving and distributing data or developing products. As a measure of OCS capabilities, the Project Evaluator for EARTHSTORM noted that:

"The EARTHSTORM summer institutes and overall project has been effective and successful in the attainment of the goals set forth in the original proposal. Teachers have gained knowledge, proficiency with the computer, and interest needed to help their students learn meteorology and related topics. The professional development of the teachers in this program translated to increased knowledge, skill, and interest in science and meteorology among their students."

Project Director Crawford helped test and evaluate the prototype NEXRAD radar in 1989, and implemented the Mesonet in 1991. Assistant Project Director Morris helped implement the Mesonet, is literate with most computer technology, and developed software used by 250 Mesonet data users. OneNet Liaison McPherson co-developed, implemented and managed the ES Project, has extensive OneNet/Internet experience and is Assistant Director of OCS. Biographical sketches of **OK-FIRST!** personnel are documented on pages 12-14. Finally, OCS has *a legislative mandate* to "acquire, archive, process and disseminate, in the most cost-effective way possible, all climate and weather information which is or could be of value to policy and decision makers in the state." **OK-FIRST!** is consistent with that mandate.

Partnerships and Community Support

The partners in **OK-FIRST!** are: (1) Oklahoma State Regents for Higher Education who will provide ease-of-access to the Internet via their OneNet system; (2) Oklahoma Department of Public Safety who will provide telecommunications services for the Mesonet through OLETS, planning ideas and project participants; (3) the NWS (Norman, Tulsa, Silver Spring, and Boulder) who will work in partnership with **OK-FIRST!** to solve difficult dissemination issues; (4) Unisys Weather Information Services who offer the unique opportunity to *redistribute* NEXRAD data to local- and state-supported agencies at *a much-reduced price*; (5) Oklahoma State Office for Civil Emergency Management who will provide feedback, planning ideas, and project participants; and (6) the OU/NOAA Cooperative Institute for Mesoscale Meteorological Studies (CIMMS).

The benefits each expects to receive include: (1) State Regents, innovative applications of OneNet to solve practical problems; (2) Department of Public Safety, trained personnel who will have learned to apply new forms of information to improve the efficiency of operations; (3) the NWS, new insights on how perishable information changes the way public-safety agencies approach critical decisions; (4) Unisys, an understanding of how Oklahoma experiences in **OK-FIRST!** can be transferred into the other 49 states; (5) State Civil Defense, trained personnel who will have learned to apply new forms of information to improve the efficiency of operations, and (6) CIMMS, an enhancement of NOAA-approved research themes through work on "forecast improvements" and the study/mitigation of "socioeconomic effects of mesoscale weather systems."

What each partner "brings to the table" is documented in their respective support letters that begin on pages 16-25. OCS has a long history of productive working-relationships with each partner listed above that mutually benefited all parties. The establishment of the Oklahoma Mesonet is a good example of these productive relationships. Another example is the close relationship with CIMMS to learn about and apply their knowledge of mesoscale weather processes. In other words, **OK-FIRST!** provides CIMMS with a grand opportunity to contribute to the DOC/NOAA mission through its negotiated agreement with NOAA.

Support for End Users

OK-FIRST! aims to enhance the abilities of rural public safety officials to respond to weather-sensitive situations. This clientele historically has lacked the equipment or the access to utilize the latest in weather technology. As of 1994, 65 of Oklahoma's 77 counties had a population of less than 50,000 people; of these, 18 counties had less than 10,000 people. These rural offices are the primary target for **OK-FIRST!.**

This proposal grows out of feedback OCS received during the operation of the Oklahoma Mesonet. This feedback indicated the depth of the problem faced in rural areas in accessing weather information. OCS offers extensive customer support for handling both technical and contextual problems. Current staff have experience in assisting Mesonet customers install and operate software and to interpret the data. **OK-FIRST!** will increase these resources.

Representatives from rural offices and their parent agencies will be asked to participate in focus groups to define and assess specific options for delivering data products. **OK-FIRST!** will work directly with these clients to manage and interpret the burgeoning information and to improve access. For example, the Altus Civil Defense Office (one of 33 public safety agencies who have limited access to Mesonet data) contributed information to a multi-agency response to a major wildfire. A strong cold front and wind shift was approaching as the fire peaked. Mesonet information allowed firemen to take necessary precautions not to be overrun by the fire. **OK-FIRST!** will improve statewide access to relevant sources of information. Success stories like the Altus wildfire response will be replicated with implementation of **OK-FIRST!**.

Evaluation and Dissemination

Project evaluation consists of two parts: (1) assessment of participant training on the access and use of **OK-FIRST!** information; and (2) documentation of the impact of **OK-FIRST!** on work-habits and approaches to problem-solving. Assessments about end outcomes related to saving lives and protecting property also will be collected. The general evaluation design will include self-administered, pre- and post-tests with follow-ups 4 and 8 months after training, supplemented by discussion groups. Data will be collected from all project participants in each of the training groups. The intent of the various tests will be to determine participant growth in self-confidence, attitudes and efficiency in using the NII based upon the training and nurturing received throughout the project. Impact assessments will determine how (and if) agency operations improved based upon the training and nurturing. Details are in the Appendix.

A project description and example products will be posted on the WWW with links to home pages about state public safety. Project descriptions will be presented at the American Meteorological Society's (AMS) Conference on Interactive Information and Processing Systems and to the Conference on Severe Local Storms. Presentations to emergency management personnel will include the annual meeting of the Oklahoma Association of Emergency Managers and the Annual Hazards Research and Applications Workshop. Final project descriptions and evaluations will be published in peer-reviewed literature. Target publications include the *Bulletin* of the AMS, the *Bulletin* of the National Coordinating Council on Emergency Management, and *Science Communication*. A final report will be prepared that assesses project successes and

recommendations for future operations. The findings will be discussed with the project's External Advisory Committee to explore their implications.

Reducing Disparities in Access to and Use of the NII

Oklahoma is primarily a rural state with only four Metropolitan Statistical Areas (MSAs): Tulsa, Lawton, Oklahoma City/Norman, and Enid. In 1993-1994, *of all Oklahoma cities and towns,* only those in 6 counties comprising the four MSAs received more than $500,000 in a direct distribution of state funds. Municipalities located in 22 of the remaining 71 counties received less than $100,000 of these funds. County governments typically fare worse than municipalities in efforts to raise funds; only 19 *counties* received more than $50,000 in the distribution of funds.

Municipal and county governments receive funds other than those represented by these statistics, but additional funds are earmarked for specific purposes (i.e., road maintenance and construction). With small amounts of internal and external funding, many county and local governments do not have resources to prepare federal matching grants. This problem likely is worse in Oklahoma than in other parts of the country. Nationally, Oklahoma ranks between 39th and 48th in per capita general revenue, per capita property taxes, per capita total-tax revenue, and in per capita revenue from the federal government and from statewide sources.

Oklahoma has over 400 emergency management agencies. A 1995 survey found only 20 agencies had modern computer resources due to limited funding. Out of 851 fire departments, only 108 have paid or partially-paid staff. Naturally, there is a paucity of information flowing into these rural agencies. Yet, **OK-FIRST!** recognizes a need to crawl before we walk.

These statistics indicate that Oklahomans suffer from geographic and economic barriers. In a state with frequent extremes in weather conditions, **OK-FIRST!** seeks to remedy this information desert by providing local agencies with computers and access to the NII. End-users must have *a reason to use the NII.* **OK-FIRST!** addresses this concern by *providing products tailored to individual agencies* in both content and geography, and by providing training on *how to access the products* and *how to use them.* By using both the OneNet and OLETS networks, **OK-FIRST!** effectively reaches end-users in both rural and metropolitan areas. OneNet's geographical coverage will increase over the coming years, while the current bandwidth of OLETS will increase as OLETS upgrades to comply with the NCIC-2000 standards.

One advantage Oklahoma has over other states is the regulation of local telephone companies which created large local-calling areas around each MSA. The Oklahoma City and Tulsa calling areas have widths exceeding 70 miles and cover large rural areas (see Figure 1). These rural areas have the opportunity to gain the most from **OK-FIRST!** because, once access to the NII is available, they incur minimal connect-charges thereafter.